First record of Tortonese's goby, *Pomatoschistus tortonesei*, from Tunisia

by

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RÉSUMÉ. - Première signalisation de *Pomatoschistus tortonesei*, gobie de Tortonese, en Tunisie.

Le gobie *Pomatoschistus tortonesei* Miller 1968, dont la distribution géographique est limitée à la lagune de Marsala (Sicile, Italie) et à la lagune de Farawa (Libye), a été pêché pour la première fois dans six lagunes tunisiennes. Les caractères méristiques et morphométriques de *P. tortonesei* sont déterminés suite à l'examen de 30 spécimens.

Key words. - Gobiidae - *Pomatoschistus tortonesei* - Tunisian lagoons - Geographical distribution - First record.

The Mediterranean-Atlantic gobiine genus, *Pomatoschistus* Gill 1864, contains a number of small epibenthic species (Miller, 1982). This genus comprises about eleven, mainly marine, species (Quignard and Tomasini, 2000). Their abundance in coastal marine and estuarine waters reflects their success as small predators in the trophic chain of different biotopes (Miller, 1982). Systematic relationships between them are unclear. In fact, the small body size and the morphological resemblances between the members of this genus mislead to considerable taxonomic confusion (Webb, 1980; Arculeo *et al.*, 1999).

Pomatoschistus tortonesei (Fig. 1) is one of the less described species in the Gobiidae family (Mirto *et al.*, 1996). The species was described for the first time on the basis of five faded specimens discovered in the collection of the "Museo Civico di Storia Natural di Genoa" and originating from Marsala lagoon (Sicily, Italy) (Miller, 1968). Miller (1982) reported that *P. tortonesei* is abundant in the Farawa lagoon (Libya), which is located near the Tunisian-Libyan frontiers. He redescribed this species in detail and noted the possibility of finding this species along Tunisian coasts. Until this work, this species was neither reported in other western Mediterranean lagoons (Arculeo *et al.*, 1999) nor in the eastern Mediterranean ones (Miller, 1986).

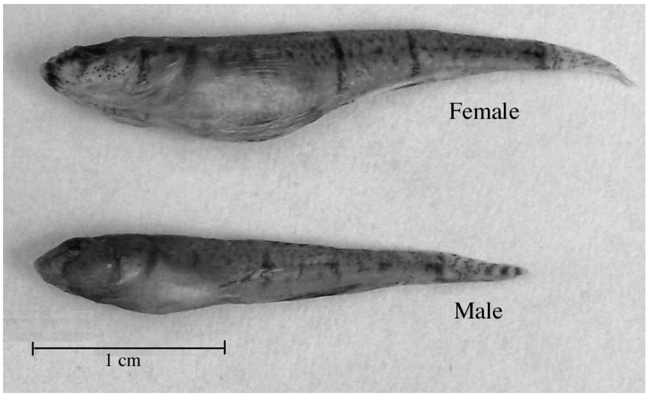

Figure. 1. - *Pomatoschistus tortonesei* (Tunisia).

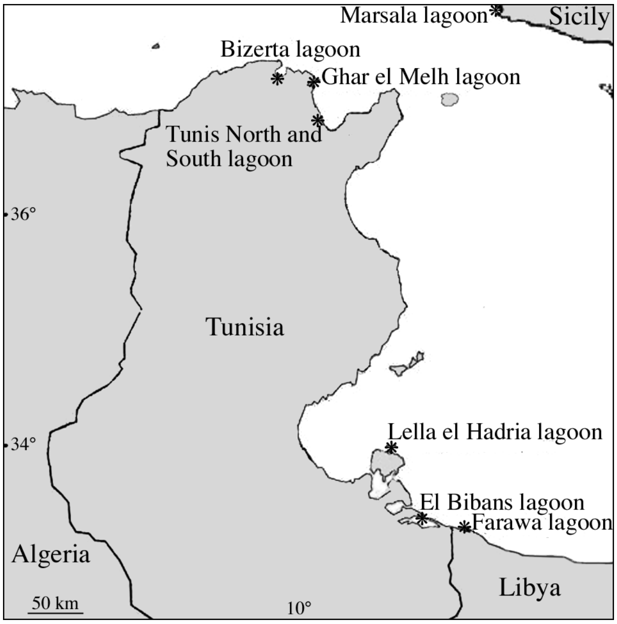

Figure. 2. - Distribution of *Pomatoschistus tortonesei* in Mediterranean lagoons and sampling sites in Tunisia. *[Distribution de* P. tortonesei *dans les lagunes méditerranéennes et sites d'échantillonnage en Tunisie.]*

MATERIAL AND METHODS

Sampling was done in six brackish coastal lagoons along the Tunisian coasts (Fig. 2). Sampling localities, dates of collections and numbers of individuals captured in each lagoon are given in table I.

A total of 27 specimens were captured using a 10 m long bag seine net with 0.5 mm mesh size. Specimens were kept in absolute ethanol after being fixed with 10% formalin until their examination. In the laboratory, they were sexed by the external shape of the urogenital papilla (Miller, 1982) and also according to their live body colouring (Figs 1, 3) (Miller, 1982; Mirto *et al.*, 1996). Specimens were deposited in MNHN collections under accession numbers MNHN 2008-0143 to 0148.

For all specimens, 25 morphometric data (Tab. II) including standard length (SL) and total length (TL) were recorded using a

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Table I. - Sampling localities, dates of collections and numbers of captured specimens of *Pomatoschistus tortonesei* in the different sampled sites in Tunisia. *[Sites de capture, dates des collections et nombres des spécimens de* P. tortonesei *capturés dans les différents sites d'échantillonnage en Tunisie.]*

Localities of sampling	N	Date of sampling
Bizerta lagoon	05	April 2006
Ghar El Melh lagoon	02	April 2007
Tunis North lagoon	05	March 2007
Tunis South lagoon	05	February 2006
Lella Hadhria lagoon	05	September 2006
El Biban lagoon	05	May 2006

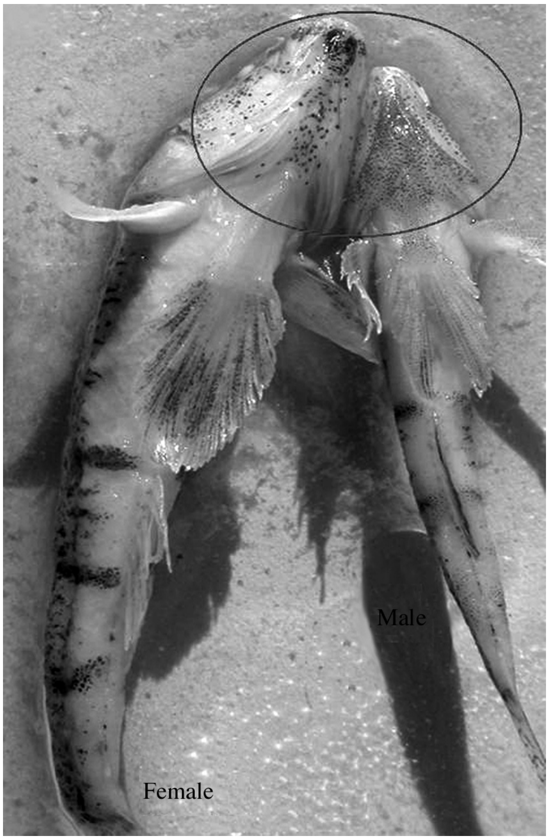

Figure. 3. - Some morphological traits illustrating the sexual dimorphism on *Pomatoschistus tortonesei*. Ventral view. ♀♀ Branchiostegal membrane and pelvic disk bright yellow. Dark chin marking. ♂♂ Pelvic disk, breast and branchiostegal membrane more or less uniformly dark and suffused yellow *[Quelques traits morphologiques illustrant le dimorphisme sexuel de* P. tortonesei. *Vue ventrale.]*

digital calliper. Additionally, the following meristic parameters were counted: number of rays in the first dorsal fin (D1), second dorsal fin (D2), anal fin (A), pectoral fin (P) and caudal fin (C); number of scales on the maximum longitudinal series (LL), and on the transverse series (LS); and number of vertebrae including urostyle (Vert). This latter parameter was determined from X-ray images obtained using a standard medical X-ray.

RESULTS

Pomatoschistus tortonesei is a small benthic fishes endemic to Mediterranean Sea (Quignard and Tomasini, 2000). It inhabits brackish, salt and hypersaline lagoons. This species frequents inshore shallows, from 0.20 (El Biban lagoon) to 2 m (Tunis South lagoon) depth, on sand near seagrass prairie (*Enteromorpha*, *Ulva* and *Cymodocea*). The examination of the stomach contents of the caught fishes showed that it feeds on small crustaceans.

Morphological description. - Body moderately slender compressed along caudal peduncle. Branchiostegal membrane attached to entire isthmus side. Coloration (Figs 1, 3) fawn with darker ferruginous reticulation. Males with numerous, ill-defined, vertical dark markings across sides and pelvic disc. Breast and branchiostegal membrane more or less uniformly dark and suffused yellow. Females with 3 conspicuous, long vertical dark bars. Pelvic disc with concentric dark band. Branchiostegal membrane bright yellow along ventral midline. Lateral line system with suborbital row *a* having one transverse row; row *b* ending anteriorly below rear of eye. Transverse level of row *b* little developed, and only *cp* may descend slightly behind row *d*. Head canals with pore *δ* but no pore ω on anterior oculoscapular canal.

Meristic counts. - First dorsal fin VI (V:2, VI:28), second dorsal fin I+7 (6-8; 6:1, 7:19, 8:10), anal fin I+7 (6-8; 6:7, 7:18, 8:5), pectoral fin 17 (16-20; 16:4, 17:16, 18:7, 19:2, 20:1). The number of scales on the maximum longitudinal series ranged from 30 to 35, those from transversal series are 10 and vertebrae are 30 (for all studied specimens).

DISCUSSION

Ecological preferences, morphological description and meristic counts (expected for pectoral fin 16) agreed with the distinctive characters of this species (Tortonese, 1975; Miller, 1982, 1986).

Some features presented in table II are not in concordance with those presented by Miller (1982) in Farawa lagoon. These differences on morphological measurements and meristic counts seem to be related to a limited gene flow between the different populations. In fact, species belonging to Gobiidae family are considered as a messinian relict (Por and Dietmann, 1985) presenting a limited genetic exchange and which DNA can maintain traits of the past. These fragmented populations can evolve independently from each other leading to the apparition of cryptic species.

Environmental conditions, climatic changes and geological events play also a key role on the structure of populations, on marine ecosystems and on speciation events (Huyse *et al*., 2004). This applies to the case of *P. tortonesei*. In fact, its benthic populations belong to different lagoons that are diverse in area, depth, connectivity with sea, and environmental and geomorphological conditions. So, as Miller (1982) suggested, it is noteworthy to determine the precise distribution and the degree of the genetic variation of this benthic species in order to clarify its systematic, to understand its phylogeography and to precise the degree of its genetic variations.

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Table II. - Body proportions of *Pomatoschistus tortonesei* in the different sampled sites. Values given are ranges in mm and, in parenthesis, mean ± SD. Abbreviations: N = number of specimens; Ab = anal fin; Ad and Aw = body depth and width at anal fin origin; Cl = caudal fin length; CHd = cheek depth; CP and CPd = caudal peduncle length and depth; D1b and D2b = first and second dorsal fin bases; E = eye diameter; H and Hw = head length and width; Pl = pectoral fin length; PO = postorbital length; SL = standard length, SN = snout length; SN/A and SN/AN = distance from snout to vertical of anal fin origin and anus; SN/D1 and SN/D2 = distance from snout to origin of first and second dorsal fins; SN/V = distance from snout to vertical of pelvic disc origin; V/AN = distance from pelvic disc origin to anus; Vd = body depth at pelvic disc origin; Vl = pelvic disc length. *[Proportions morphométriques de* P. tortonesei *dans les différents sites d'échantillonnage. Les valeurs consignées dans le tableau sont exprimées en mm, et, entre parenthèses, la moyenne ± l'écart type. Abréviations : N = effectif ; CPd = hauteur du pédoncule caudal ; D1b = longueur de la base de la première nageoire dorsale; D2b = de la base de la deuxième nageoire dorsale; E = diamètre de l'œil; H = longueur de la tête; Hw = largeur de la tête; Pl = longueur de la nageoire pectorale; PO = distance préorbitaire; SL = longueur standard ; SN/A = distance préanale; SN/D1 et SN/D2 = distances prédorsales; SN/V = distance pelvienne; Vd = hauteur du corps; Vl = longueur de la nageoire pelvienne.]*

Localities	Ghar El Melh Lagoon	Bizerta lagoon		Tunisian North LAC		Tunisian South LAC	Lella ElHadria lagoon (Jerba)		El Bibans lagoon
Sexes	Females	Females	Males	Females	Males	Females	Females	Males	Females
N	2	4	1	2	3	5	4	1	5
SL	25.24-26.47 (25.85± 0.87)	27.53-31.04 (29.40±1.54)	29.25	25.52-27.74 (26.63±1.57)	25.57-29 (27.26±1.71)	22.08-26.28 (24.05±1.68)	22.78-27.6 (24.51±2.12)	24.98	25.57-28.64 (27.25 ±1.11)
H/LS	26.82-27.46 (27.13±.45)	26.29-30.12 (27.70±1.69)	27.55	27.74-28.19 (27.97±0.32)	25.72-29.26 (27.68±1.79)	25.85-31.16 (28.25±2.14)	24.45-28.91 (26.89±1.84)	27.14	26.05-29.34 (28.01 ±1.42)
HW/LS	13.07-14.02 (13.55±0.67)	14.40-15.64 (15.03±0.66)	16.34	14.85	15.21-17.94 (16.26±1.47)	13.27-15.68 (14.39±1.08)	15.23-16.19 (15.53±0.45)	13.97	13.36-15.89 (15.28 ±1.08)
SN/D1/LS	32.72-39.89 (36.31±5.07)	35.25-36.82 (36.16±0.67)	34.29	35.30-37.02 (36.167±1.21)	25.76-38.68 (34.08±7.16)	33.79-37.91 (35.47±1.64)	33.58-37.75 (35.28±1.90)	36.11	34.20-40.87 (37.77 ±3.17)
SN/D2/LS	53.53-60.69 (57.11±5.06)	57.27-59.02 (58.06±0.83)	55.52	58.38-58.72 (58.557±0.24)	54.89-57.49 (56.48±1.39)	53.04-64.55 (59.35±4.20)	53.82-59.56 (56.53±2.42)	57.53	56.94-59.52 (58.23 ±1.14)
SN/AN/LS	46.50-54.55 (50.53±5.69)	47.55-51.45 (49.99±1.70)	47.21	48.55-50.76 (49.657±1.56)	47.44-48.75 (48.22±0.69)	41.39-52.00 (47.89±4.62)	44.38-49.89 (48.01±2.52)	48.92	49.35-50.77 (50.12 ±0.67)
SN/A/LS	55.00-56.85 (55.93±1.31)	57.21-61.10 (58.97±1.60)	57.37	56.07-56.52 (56.29±0.32)	53.38-55.02 (53.94±0.94)	55.65-63.14 (58.77±3.04)	56.49-59.29 (57.92±1.15)	56.84	56.71-59.09 (57.85 ±1.05)
SN/V/LS	30.07-31.18 (30.63±0.78)	32.67-34.09 (33.28±0.66)	32.07	32.29-33.03 (32.67±0.51)	30.62-32.76 (31.51±1.11)	31.57-33.95 (32.81±0.85)	30.03-35.42 (32.30±2.49)	33.95	31.92-37.05 (34.21 ±2.14)
CP/LS	16.13-21.39 (18.76±3.72)	19.62-20.79 (20.13±0.51)	22.43	20.81-21.38 (21.09±0.40)	21.66-24.65 (22.80±1.62)	16.25-23.43 (19.72±3.22)	18.52-21.12 (19.97±1.14)	20.87	18.28-21.47 (20.16 ±1.22)
D1b/LS	13.56-17.71 (15.64±2.93)	15.70-17.83 (16.72±0.89)	16.75	15.44-17.52 (16.48±1.47)	14.82-23.79 (19.55±4.50)	15.52-19.11 (17.28±1.32)	15.63-19.72 (17.55±2.09)	18.25	13.84-17.92 (15.91 ±1.81)
D2b/LS	19.93-19.79 (19.86±0.09)	18.78-21.80 (19.99±1.33)	20.65	18.46-20.69 (19.57±1.58)	20.10-30.55 (25.46±5.23)	15.88-21.92 (19.08±2.26)	19.76-20.98 (20.46±0.56)	21.82	19.22-20.01 (19.64 ±0.29)
Ab/LS	18.43-19.41 (18.92±0.69)	18.59-19.31 (18.83±0.34)	23.76	17.19-18.96 (18.08±1.25)	18.34-26.84 (22.62±4.25)	14.74-21.74 (18.76±2.59)	18.73-20.85 (19.99±1.03)	22.54	17.16-21.23 (19.06 ±1.65)
Cl/LS	13.60-18.14 (15.87±3.21)	17.29-18.65 (17.90±0.62)	18.39	15.83-16.33 (16.08±0.35)	17.01-18.89 (18.23±1.06)	11.84-17.57 (15.18±2.52)	17.14-18.11 (17.58±0.43)	17.65	15.42-16.99 (16.24 ±0.64)
Pl/LS	17.75-22.10 (19.93±3.08)	18.31-21.54 (19.85±1.34)	19.59	20.51-20.81 (20.66±0.21)	17.48-21.61 (19.95±2.18)	18.57-24.79 (21.72±2.20)	18.77-20.51 (19.33±0.82)	20.49	18.32-20.77 (19.39 ±1.07)
VI/LS	19.83-23.45 (21.64±2.56)	21.32-25.65 (23.52±2.00)	20.03	22.78-25.39 (24.09±1.84)	22.96-26.01 (24.56±1.53)	22.94-25.78 (24.42±1.15)	19.51-25.80 (23.35±2.78)	21.77	21.43-24.25 (22.55 ±1.12)
Vd/LS	16.01-17.75 (16.88±1.22)	16.08-17.79 (17.27±0.8)	18.29	18.96-22.84 (20.90±2.74)	17.28-21.51 (19.19±2.14)	12.45-23.03 (17.92±4.65)	13.92-19.31 (17.87±2.63)	15.93	13.25-19.28 (16.25 ±2.19)
Ad/LS	12.35-13.70 (13.03±0.96)	13.17-15.69 (14.28±1.15)	15.83	12.83-15.44 (14.14±1.84)	12.79-16.58 (15.13±2.05)	9.84-15.42 (13.16±2.10)	11.98-14.42 (12.82±1.09)	12.29	12.02-16.34 (13.97 ±1.75)
CPd/LS	5.93-7.09 (6.51±0.82)	6.06-7.35 (6.61±0.56)	7.14	6.57-6.97 (6.77±0.29)	7.39-8.52 (7.81±0.62)	5.86-7.61 (6.59±0.68)	6.45-7.07 (6.73±0.25)	7.61	6.84-7.43 (7.15 ±0.22)
V/AN/LS	16.20-18.62 (17.41±1.71)	15.58-22.00 (19.15±2.67)	18.36	18.57-20.22 (19.39±1.16)	18.03-20.33 (19.08±1.16)	13.84-21.88 (17.07±3.16)	14.94-18.96 (16.67±1.94)	15.49	15.29-19.55 (17.18 ±1.55)
CPd/CP	34.96±2.56 (33.15-36.77)	29.16-37 (32.89±3.42)	31.86	30.69-33.52 (32.10±2.00)	30.49-39.35 (34.43±4.51)	30.74-37.44 (33.74±2.73)	32.52-36.25 (33.77±1.70)	36.47	31.87-38.81 (35.57 ±2.79)
SN/H	28.17-30.16 (29.16±1.41)	22.00-33.09 (26.32±4.84)	34.49	29.16-30.08 (29.62±0.65)	31.24-39.81 (36.04±4.38)	20.63-27.52 (24.66±3.24)	17.42-32.49 (27.84±7.00)	28.47	23.35-29.58 (26.49 ±2.72)
E/H	26.62-28.14 (27.08±1.07)	29.7-33.63 (31.2±1.79)	32.01	26.34-29.80 (28.07±2.45)	28.14-32.04 (30.24±1.97)	25.03-31.97 (29.85±2.85)	24.44-33.39 (29.66±3.95)	32.15	26.51-29.73 (27.80±1.28)
PO/H	41.83-40.11 (40.97±1.21)	38.79-51.25 (43.65±5.48)	40.94	38.34-39.26 (39.05±0.29)	46.78-47.49 (47.04±0.38)	38.83-45.26 (42.83±2.61)	35.46-46.22 (41.36±4.67)	41.45	37.73-49.11 (42.79±4.12)
CHd/H	16.30-16.76 (16.53±0.32)	10.01-15.33 (11.99±2.33)	11.17	12.99-15.98 (14.49±2.11)	15.58-30.16 (20.73±8.18)	10.62-15.44 (12.91±2.22)	9.47-14.36 (11.33±2.11)	14.75	10.17-15.61 (13.31 ±2.44)
Hw/H	48.73-51.08 (49.91±1.66)	51.92-56.54 (54.31±1.91)	59.3	52.68-53.53 (53.11±0.59)	55.65-61.30 (58.69±2.85)	48.17-56.86 (51.03±3.51)	52.88-66.25 (58.03±5.73)	51.48	49.2-60.96 (54.60 ±4.19)

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